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AUTHOR Faber, Melissa M.
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ABSTRACT

The purpose of this study was to determine whether context facilitated memory and whether this facilitation was still evident after a delay. Infants were expected to recognize pictures significantly longer when they were tested with the same context cues. This context effect was expected to be even after a 5-minute delay. The subjects were 64 six-month-olds whose parents were recruited from newspaper announcements. The testing apparatus allowed the observer to watch corneal reflections of the stimuli. Findings confirmed the belief that contextual cues would influence recognition memory. Contextual cues that were identical during encoding and retrieval facilitated infants' recognition memories. A somewhat unexpected finding was the lack of contextual cue influence after a delay. This finding may indicate that infants of this age cannot recognize an object after a 5-minute delay. But such a state of affairs seems implausible in light of Fagan's earlier research findings. Another explanation for the lack of recognition memory after a delay may be the complexity of the context. Infants may have been overwhelmed with the stimuli. Research with simpler stimuli are planned. Contains 15 references. (LB)

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Effects of Stimulus Context, Study Time, and Delay on Visual Recognition Memory in Six-Month-Old Infants

Melissa M. Faber

University of Toledo

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Running Head: STIMULUS CONTEXT

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Stimulus context facilitates memory performance in adults as well as in children (Smith, 1986; Ackerman, 1985a, 1985; Hazen & Volk-Hudson, 1984; Riccio, Richardson, & Ebner, 1984). Stimulus context is believed to be encoded with to-be-remembered information. Context is also believed to facilitate memory when context cues are the same during study and retrieval. These assumptions have also been found to be true with infants (Haaf & Lundy, 1991; Haaf, Lundy, Bennett, Loboschefski, & Levy, 1990; Fagen, Ohr, Singer, & Klein, 1989; Rovee-Collier, Earley, and Stafford, 1989; Hayne, Rovee-Collier, & Perris, 1987; Rovee-Collier & Hayne, 1987; Rovee-Collier, Griesler, & Earley, 1985; Fagan, 1984).

Using a conditioning paradigm, Rovee-Collier et al. (1985) concluded that infants as young as three months old show memory retention with the aid of stimulus context. Rovee-Collier et al. (1985) defined retention as the amount of kicking the infant produced to move a mobile. Baseline measures of responding were recorded during two 15-minute training sessions 24 hours apart. Each infant received training in the presence of either one of two crib bumpers. A third session occurred either one or two weeks later in the presence of either the original or a novel crib bumper. Results showed that only infants tested with the same training context after one week continued to respond at a rate significantly above operant level. Rovee-Collier et al. (1985) concluded that stimulus context aided retention after one

week when 3-month-old infants were tested in contexts the same as in which they had been trained.

Consistent with Rovee-Collier (et al. (1985), Haaf et al. (1990) found infant memory to benefit from contextual cues. Using the visual attention paradigm, six-month-old infants were familiarized to a target stimulus and then were shown that stimulus paired with a novel one in a recognition test. According to the visual attention paradigm, infants should fixate longer at a novel stimulus if the target stimulus is recognized. Recognition was tested under conditions in which the background context cues were either the same as or different from those which were present during familiarization. If context does facilitate recognition memory then recognition should be greater in the same than in the different context condition. Results supported this hypothesis, with recognition scores being greater in the same compared to the different context condition.

Haaf et al. (1990) tested context effects with testing immediately following familiarization. Context is also expected to improve memory after delays. Infants have been found to recognize pictures after temporal delays. Fagan (1971 & 1973) demonstrated improved recognition memory after a delay in 3-, 4-, and 5-month-old infants.

In the first experiment, Fagan (1973) familiarized infants to black and white abstract pictures varying either multidimensionally or only in patterning (different arrangements

of black squares). During the first session a 2-minute familiarization period was followed by an immediate recognition test by pairing the previously exposed target with novel stimuli. The second session was the same except that test occurred 24 hours after familiarization for half the infants and 48 hours later for the remaining infants.

Fagan found that infants 21-25-weeks of age were capable of recognizing to-be-remembered stimuli after 48 hours, even when the target stimuli differed only in pattern arrangement. In other words, infants demonstrated recognition after a delay even when the novel picture was just a slight variation of the target stimuli.

Fagan also tested delayed recognition for pictures of faces in 23-week-old young infants. The procedure was the same as the above experiment, with delayed tests at 3-hours, 24-hours, 48-hours, 1-week, and 2-weeks. Results showed that infants recognized the pictures after all retention intervals. Fagan demonstrated that infants are capable of remembering simple and complex stimuli after short and long delays.

With evidence that infants remember stimuli after delays and that context facilitates recognition memory, it is hypothesized that context aids retention after delays. Infants should remember stimuli significantly longer if presented with the same context during familiarization and test.

The purpose of this study was to determine whether context facilitated memory and if this facilitation was still evident

after a delay. Infants were expected to recognize pictures significantly longer when studied and tested with the same context cues. This context effect was expected to be found even after a 5-minute delay.

Method

Subjects

Sixty-four 6-month-old infants participated in this study. Parents of these infants were recruited from newspaper birth announcements. Parents were phoned or contacted by letter and asked to participate. Parental consent was obtained for all participating infants. Half of the infants were male with the remaining infants being female.

Apparatus

A three sided gray chamber with a two window screen centered in the middle panel served as the familiarization and testing apparatus. A peephole centered below the two screens allowed the observer to watch corneal reflections of the stimuli. Stimuli were presented onto the two screens from two slide projectors positioned behind the apparatus. Looking times of the infants were recorded by the observer using a toggle switch. Data were recorded and slide projectors were controlled by computer.

Target stimuli were a snowman, cat, french fries and ketchup, and jelly and bread. Background contexts included circles on an aqua background, stars on a brown background, purple and white squares, and pink plaid.

Design

Infants were familiarized with a target stimulus presented on a contrasting background and then tested with target and novel stimuli. The contrasting background present during familiariztaion and retrieval provided contextual cues for the infants. Infants were presented with recognition memory problems in a 2 (Context Condition) x 2 (Delay) x 2 (Study Time) experimental design. Each subject received two recognition problems, one with a 30 second and the other with a 45 second study time. For half of the infants, the recognition test occurred immediately after familiarization; for the remaining infants the test occurred after a five minute delay. Recognition was tested under conditions in which retrieval context-cues were identical to (Same Context) or different from (Different Context) the context cues present during familiarization.

Procedure

Infants were randomly assigned to a context condition, with half of the infants receiving the same context during familiarization and test and the other half receiving a different context for testing. The parent was asked to sit facing the screen with the infant in the lap. The infant's eyes were 15 inches from the screen. Looking time began with the infant's first fixation. When the reflection of the light from the projector was centered on the baby's pupil, fixation on the stimuli occurred.

Familiarization began with the first picture presented on the baby's right. The stimulus was presented for the second time on the baby's left. Familiarization was infant controlled. The stimuli advanced after the infant looked for a total of 30 or 45 seconds, half of the time when the stimulus was presented on the right and the other half when the stimulus was presented on the baby's left. Study time was counterbalanced so that half of the infants received 30 seconds of study time for the first problem and 45 seconds for the second problem. The other 32 infants received 45 seconds then 30 seconds respectively for problem one and two.

After familiarization, infants either experienced a five minute delay or an immediate test, depending on the order they were randomly assigned to. During the delay, mother and infant were asked to turn around and face the wall opposite the chamber. Information was gathered from the parent and infant was given toys to play with during the delay. Infants in the immediate test condition were tested immediately following familiarization.

Test consisted of target stimuli paired with novel stimuli. Stimuli were presented twice for ten seconds each. The target stimulus was shown once on the left and once on the right, with the novel stimulus on the opposite side. After test, a ten second delay occurred before problem two began.

Problem two was procedurally the same as problem one except for study time and stimulus set. Looking times or fixations were

used as a measure of recognition. After completion of problem two, two Raggedy Ann slides appeared to let the parent know that the procedure was over. At the end of the session, parents were thanked and babies given a Master of Infancy certificate.

Results

A 2 (Context Condition) x 2 (Delay) x 2 (Study Time) analysis of variance was conducted on the percentage of looking time directed toward the novel stimulus during test trials. Recognition was significantly greater in the Same Context than in the Different Context, $F(1,60) = 15.62$, $p < .05$, with mean percentages of 61.6 and 49.7, respectively. Significant results were also found for the Delay Factor, $F(1,60) = 13.33$, $p < .05$. Recognition scores were greater for infants in the Immediate Test than those in the Delayed Test (mean percentages of 61.1 and 50.2). Results showed that study time did not influence recognition. No interactions were significant.

Discussion

Findings confirmed the belief that contextual cues influence recognition memory, even in infants as young as six months. Contextual cues that were identical during encoding and retrieval facilitated infants' recognition memories. A somewhat unexpected finding was the lack of contextual-cue influence after a delay. This finding may indicate that six-month-old infants cannot recognize an object after a five minute delay. However, this explanation does not seem plausible since Fagan (1973)

demonstrated recognition memory in 4- and 5-month-old infants after delays of 3 hours, 24 hours, 1 week and 2 weeks.

Fagan (1973) offered another explanation for lack of recognition memory in infants after a delay. Fagan found that infants may be experiencing interference from perceptually similar material that was presented during delays. If this is true, then stimuli presented during the delay in the current study may have interfered with infants' recognition of target stimuli. In the present study the infants were taken out of the apparatus and placed on a bright yellow changing table and presented with bright stimulating toys. These toys and bright colors may have interferred with the infants' ability to successfully encode the target stimuli.

Another explanation for lack of recognition memory after a delay is the complexity of the context. Context varied multidimensionally, thus presenting a lot of information to be encoded. The infants may have been overwhelmed with the stimuli, resulting in poor recognition scores.

Currently, a study is being conducted with the same method, but with simpler stimuli and minimum stimulation during the delay. Results are expected to show that contextual cues facilitate recognition memory, even after a short delay.

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